

**European *Atrichopogon* of the *pavidus* group  
(Diptera: Ceratopogonidae)**

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**ABSTRACT.** The European pollen feeding *Atrichopogon pavidus* (WINNERTZ) and *A. aethiops* (GOETGHEBUER) are revised, interpreted and illustrated. *A. pollinivorus* DOWNES, 1955 is recognised as a junior synonym of *A. pavidus* (WINNERTZ, 1852).

**KEY WORDS:** Diptera, Ceratopogonidae, *Atrichopogon*.

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INTRODUCTION

Adults of *Atrichopogon* KIEFFER can be easily separated from related *Forcipomyia* MEIGEN by the thoracic paratergite bearing at least 1 seta (SZADZIEWSKI et al. 1995). They are common in all moist terrestrial habitats throughout the world including oceanic islands. The oldest fossils were reported from Eocene Baltic amber (SZADZIEWSKI 1988, 1996). The genus is a young group of Tertiary origin, which probably still is in the radiation stage of its evolution, which makes troubles in understanding the infraspecific variation and relationships between the species.

The species described below are included in the subgenus *Atrichopogon* s. str. that is the most difficult and neglected group within the genus. A key to subgenera is presented by SZADZIEWSKI et al. (1995). Species of the subgenus are very similar and the characters which can be used for their determination are limited and highly variable.

*Atrichopogon pavidus* was originally described from Germany in the genus *Ceratopogon* MEIGEN by WINNERTZ (1852). Both sexes were reared from bark of a rotting tree. Subsequently GOETGHEBUER (1920) described a related species *A. aethiops* from Belgium. GOETGHEBUER (l.c.) showed that they differed in the shape of male genitalia, colour of halteres, distribution of macrotrichia on wing membrane and in the female

antennae. EDWARDS (1926) reported both species from Britain and commented on *A. aethiops* "Very similar to *A. pavidus*, differing almost solely in the hypopygium...". GOETGHEBUER (1934) in a key used the colour of a halter (blackish brown in *A. aethiops*, white on apex in *A. pavidus*), male genitalia (tergite IX blunt in *A. pavidus* and pointed in *A. aethiops*), and distribution of macrotrichia on wing membrane (few in *A. aethiops*, numerous in *A. pavidus*). DOWNES (1955) described in detail pollen eating *A. pollinivorus* from Scotland. He noticed a considerable range of variation between forms associated with different flowers and concluded they are local populations of a species of sedentary habits. REMM (1961) in a key to the determination of *A. pavidus* and *A. aethiops* applied colour of halteres, proportions of female flagellomeres, shapes of female abdominal sternite VII and male tergite IX. In the Polish fauna KRZYWIŃSKI (1987) recognized three species (*pavidus*, *aethiops* and *pollinivorus*) and presented diagnostic figures of male genitalia. KRZYWIŃSKI (l.c.) stated that *A. pavidus* reported from Germany by HAVELKA & CASPERS (1981) is *A. aethiops* and suggested that the male genitalia presented by REMM (1961) for *A. aethiops* belong to *A. pollinivorus*.

Present examination of *Atrichopogon* from different localities and collections shows that in Europe only two species can be distinguished and actually *A. pollinivorus* is synonymous with *A. pavidus*. I follow here the proposition by DOWNES (1955) to treat the species related to *pavidus* as a species group within the subgenus *Atrichopogon*.

#### **Acknowledgements**

I am grateful to Dr P. Grootaert (Bruxelles), Dr hab. T. Zatwarnicki (Wrocław), Dr W. Mikołajczyk (Warsaw), Dr J. Luig (Tartu) and Dr J.-P. Haenni (Neuchâtel) who kindly arranged loans of the material.

This study was supported by the State Committee for Scientific Research (KBN), grant No. 1155/PO4/2000/19.

## MATERIALS

The present study is based on specimens mounted on microscope slides from the following collections: Department of Invertebrate Zoology, University of Gdańsk, Museum and Institute of Zoology, PAS, Warsaw, University of Tartu, Institut Royal des Sciences Naturelles de Belgique, Bruxelles, and Musée d'histoire naturelle de Neuchâtel.

## DESCRIPTIONS

### *Atrichopogon* KIEFFER (subg. *Atrichopogon*)

#### *pavidus* species group

#### **Diagnosis**

Differing from other *Atrichopogon* of the subgenus *Atrichopogon* in the following

combination of characters: thoracic paratergite usually with 2 setae, eyes hairy and macrotrichia on wing membrane usually present in both sexes, female distal flagellomeres (9-13) relatively short. Females feed on pollens.

### Species included

*A. pavidus* and *A. aethiops*.

### Discussion

Within the subgenus *Atrichopogon* s. str. the *pavidus* species group has more than one seta (usually 2) on the thoracic paratergite. However, that character state is not stable and sometimes left, right or both paratergites bear only one seta as in other species of the subgenus. Similarly sometimes the male wings have totally reduced macrotrichia.

*A. brevipalpalis* REMM from Eastern Palaearctic (the Kuril Islands) does not belong to the *pavidus* species group as suggested by REMM (1993) because the male has bare wings, and the paratergite bears only a single seta (present examination).

Feeding of females on pollens within *Atrichopogon* is not limited to the *pavidus* species group. The similar feeding habits exhibit all species of the subgenus *Psilokempia* ENDERLEIN (DE MEILLON & WIRTH 1989).

### *Atrichopogon pavidus* (WINNERTZ, 1852)

*Ceratopogon pavidus* WINNERTZ, 1852: 33 (Germany, male, female, Fig. V 25 a,b wings of male and female, reared from larvae living under bark of a rotting tree).

*Kempia pavidus*: GOETGHEBUER 1920: 34 (Belgium, Fig. male genitalia).

*Atrichopogon (Kempia) pavidus*: EDWARDS 1926: 399 (England, common, especially on honeysuckle flowers); GOETGHEBUER 1934: 26 (Germany, Belgium, Netherlands, Austria, England, May-June).

*Atrichopogon* (s. str.) *pavidus*: REMM 1961: 927 (in a key, Estonia); REMM 1988: 89 (Central and North Europe, Lithuania, Estonia, European Russia, East Siberia, Georgia, Kirghizia); KRZYWIŃSKI 1987: 795 (Poland, male genitalia); KNOZ 1997: 83 (Czechia).

*Atrichopogon pollinivorus* DOWNES, 1955: 442 (male, female, Great Britain). **Syn. n.**

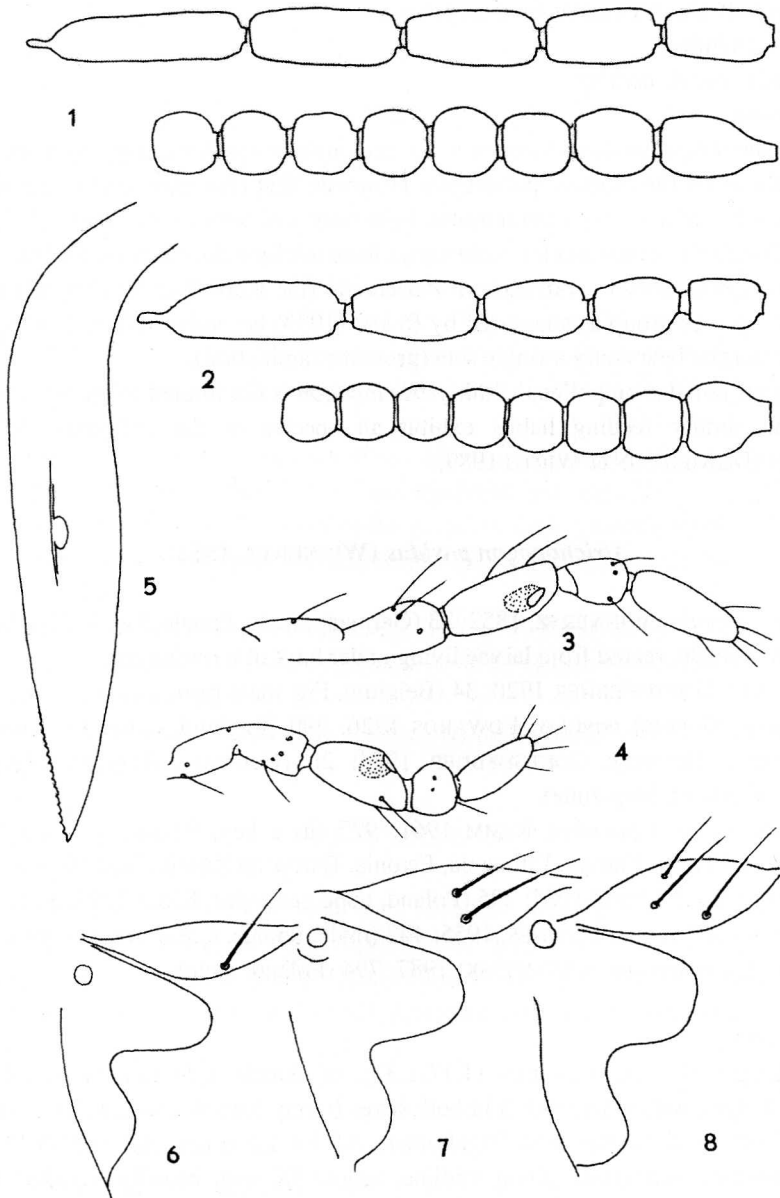
*Atrichopogon pollinivorus*: KRZYWIŃSKI 1987: 794 (Poland, male).

### Diagnosis

Wing length of male 1.24 mm (1.17-1.33), of female 1.24 mm (1.06-1.40), wing membrane at apex with macrotrichia in both sexes (rarely bare in male), halteres brownish, male flagellomere X shorter than flagellomere XI 1.4-1.6 times, AR 0.69-0.77 (Table), aedeagus strongly sclerotized along midline, tergite IX with broadly rounded, blunt or emarginate apex, female flagellomere VIII 1.5-1.6 times shorter than flagellomere IX.

### Description

**Male.** Body almost black, dark brown to brown. Halteres more or less brownish in mounted specimens, in pinned apex of the knob pale. Eyes pubescent. Length of flagellum 680-810  $\mu\text{m}$ , AR 0.69-0.77, flagellomere XI 1.4-1.6 times longer than flagellomere X (Fig.



**Figs. 1-8.** Female of *Atrichopogon pavidus* (1, 3, 5-8) and *A. aethiops* (2, 4). 1-2 - flagellum, 3-4 - palp, 5 - mandible, 6-8 - thoracic paratergite and anterior anepisternum.

16). Flagellomeres II-VIII usually or II-VII, II-VI something fused or even all flagellomeres separate. Third palpal segment 48-60  $\mu\text{m}$  long. Wing length 1.24 mm (1.17-1.33), CR 0.59-0.64, macrotrichia present in cells R5 and M1, only in R5 (few along wing margin), or totally absent. Paratergite with 1-3 setae, usually 2 at least on left or right side, rarely 3. Prothoracic sternite trapezoid as in female, with expanded apicolateral corners. Anterior anepisternum B-shaped, the upper lobe large and blunt. Scutellum with 2 lateral and 2 submedian long marginal setae. Legs uniformly coloured, tarsi more pale, without diagnostic characters. Claws with bifid apices. Tarsal ratio (TR) of fore leg TR(I) 2.3-2.6, of mid leg 2.3-2.5, of hind leg 2.1-2.3 (Table).

Genitalia variable (Figs. 21-29). Sternite IX with broad caudomedian excavation which bears 9-13 long setae along margin in 1-2 irregular rows. Tergite IX 0.9-2.0 times of gonocoxite length; highly variable in length and shape; it is shorter, equal or longer than gonocoxite, extending well beyond gonocoxites (Figs. 24-26), reaching apices of gonocoxites (Fig. 22) or not (Fig. 21); apex broadly rounded (Figs. 21, 23, 29), blunt (Fig. 24) or even concave (Fig. 25). Gonocoxite (112-132  $\mu\text{m}$ ) usually longer than gonostyli (112-128  $\mu\text{m}$ ); aedeagus shield-shaped, with curved dorsally lateral and apical margins (Figs. 18, 19); basal arch strongly sclerotized, basal arms directed dorsally towards strong dorsal roots of gonocoxites (Fig. 20); central area of the aedeagus heavily sclerotized along midline (Fig. 19).

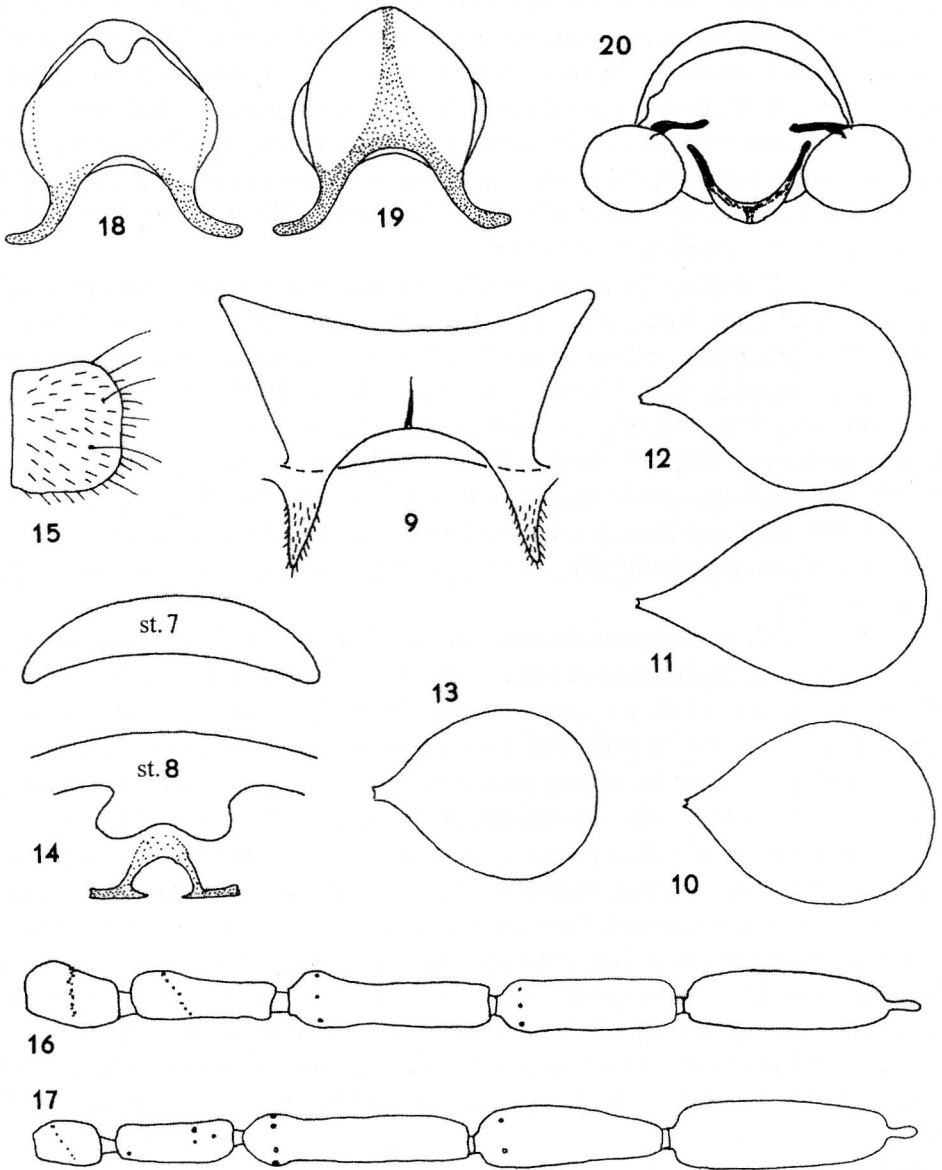
**Female.** Similar to male with the usual sexual differences. Eyes pubescent. Flagellum length 562- 629  $\mu\text{m}$ , flagellomere IX longer than VIII 1.5-1.6 times (Fig. 1), AR 1.11-1.20. Third palpal segment 44-48  $\mu\text{m}$  long, sensorial pit small, located on distal half; fourth palpal segment short (Fig. 3); fifth palpal segment with evenly pointed apex. Mandible with small teeth (Fig. 5), about 15, slightly growing in size to the apex. Wing length 1.24 mm (1.06 - 1.40), CR 0.66 - 0.69; macrotrichia present in cells R5, M1, sometimes in M2. Paratergite bearing usually 2 long setae at least on left or right paratergite, rarely 1 or 3 (Figs. 6-8). Prothoracic sternite trapezoid (Fig. 9). Empodial hairs simple. Abdominal sternites well sclerotized; sternite 7 narrow, with slightly concave caudal margin; sternite 8 fused with the tergite into a ring; a weakly sclerotized, concave caudal lobe covers the subgenital plate (Fig. 14); subgenital plate not fused with tergite 9, weakly sclerotized, arch-shaped, basal sclerotization interrupted at middle; sternite 10 weakly sclerotized, cerci very short, in lateral view almost rectangular (Fig. 15); seminal capsule single, usually ovoid, with a short neck (Fig. 10), rarely elongated, pyriform (Figs. 11, 12), length 100-120  $\mu\text{m}$ .

### Material examined

**Belgium:** Destelbergen, 26 May 1936, 1 male, M. Goetghebuer, coll. R.I.Sc.N. B. (Bruxelles).

**Bulgaria:** Pirin Mts., Popina lake, 26 June 1982, 1 male, W. Krzemiński; Rila Mts., Skakavica, 1580 m, 20 July 1976, 1 female, R. Szadziewski.

**Switzerland:** Grangettes, Gros Brassat, 19 June 1992, 2 females.



**Figs. 9-20.** Female (9-14) and male (15-20) of *Atrichopogon pavidus* (9-12, 14-16, 18-20) and *A. aethiops* (13, 17). 9 - prothoracic sternite, 10-13 - seminal capsules, 14 - subgenital plate and abdominal sternites 7 and 8, 15 - lateral aspect of cercus, 16, 17 - distal flagellomeres, 18 - ventral aspect of aedeagus, 19 - dorsal aspect of aedeagus, 20 - top view of male genitalia.

**Poland: Southern Baltic Coasts:** Brzyno at Żarnowieckie Lake, 8 July 1980, at light, 1 male, 2 June 1982, Apiaceae, 2 males, 1 female, 12 June 1982, at light, 1 male, R. Szadziewski; Bychowo at Choczewskie lake, 15 June 1979, 1 female, R. Szadziewski; Porzecze n. Lębork, *Peucedanum oreoselinum*, 12 July 1985, 2 males, J. Krzywiński; Żydowo n. Sławno (Sydow), 3 July 1938, 1 male, O. Karl; Warnowo, Wolin Isl., *Aegopodium podagraria*, 22-23 June 1993, 6 males 3 females, J. Krzywiński; **Eastern Baltic Coasts:** Wysok n. Kętrzyn, 15-29 May 1993, 1995, 19 males, 4 females, E. Kaczorowska; 5 June 1999, 1 male, W. Giłka; 6 June 2000, 3 males, 5 females, R. Szadziewski; **Southern Baltic Lakelands:** Babimost n. Zielona Góra, 21 June 1987, 1 female, 4 Aug. 1987, 1 female, Inst. Zool. PAS; Bory Tucholskie, o. 340 a, 1 male, IZPAN; Miastko, Apiaceae, 4-12 July 1990-91, 4 males, A. Warzocha; Ocypel n. Tuchola, *Pimpinella saxifraga*, 31 July 1984, 1 male, J. Krzywiński; Raciąż n. Tuchola, 1 June 1993, *Ribes*, 1 male, 2 females, W. Giłka; Żakowo n. Sulęczyń, 27 July 1996, 1 male, E. Kaczorowska; **Eastern Baltic Lakelands:** Gietrzwałd n. Olsztyn, Apiaceae, 14-21 July 1991, 4 males, K. Podbielska; Kunicha n. Sztabin, *Conium maculatum*, 22 June 1985, 2 males, *Angelica silvestris*, 8 Aug. 1984, J. Krzywiński; Lubomin n. Morąg, 27 June 1992, 1 male, J. Krzywiński; Rutka-Tartak, *Aegopodium podagraria*, 2 July 1993, 1 male, J. Krzywiński; Sztabin, *Conium maculatum*, *Sium latifolium*, *Anthriscus silvestris*, 7 July 1985, 1 male, 7-9 August 1985, 3 females, J. Krzywiński; **Central Lowlands:** Brzeg on the Odra river, 11 June 1992, 4 males, 5 females, J. Krzywiński; **Podlasie:** Bałowieża Primeval Forest, o. 315, 6 July 1991, 1 male, o. 538, 31 July 1987, 1 female, o. 634, 17 July 1987, 4 males, 1 female, o. 668, 2 July, 1987, 2 males, yellow pan traps, Inst. Zool. PAS; **Central Małopolska Upland:** Pińczów, 11 June 1993, 1 female, J. Krzywiński; Zabłocie n. Kielce, 14 June 1993, 3 males, J. Krzywiński; **Sudety Mts:** Kaczawskie Mts., Janowice Wlk., 25 June 1993, 32 males, Nieleśno, 24 June 1993, 2 males, 1 female, Pilchowice, 24 June 1993, 4 males, 4 females, Tarczynka, Apiaceae, 23 June 1993, 4 males, 6 females, Wleń, 24 June 1993, 7 males, E. Kaczorowska; **Outer West Carpathians:** Babia Góra Mts., Zawoja-Barańcowa, 27 June 1989, 1 male; Zawoja-Czatoża, Apiaceae, 3 July 1989, 8 males, 1 female, R. Szadziewski; **Central West Carpathians:** Pieniny Mts., Czertezik, 22 June 1988, 1 male, 1 female, R. Szadziewski; Tatra Mts., Miętusi Potok, 21 July 1993, 1 female, J. Krzywiński.

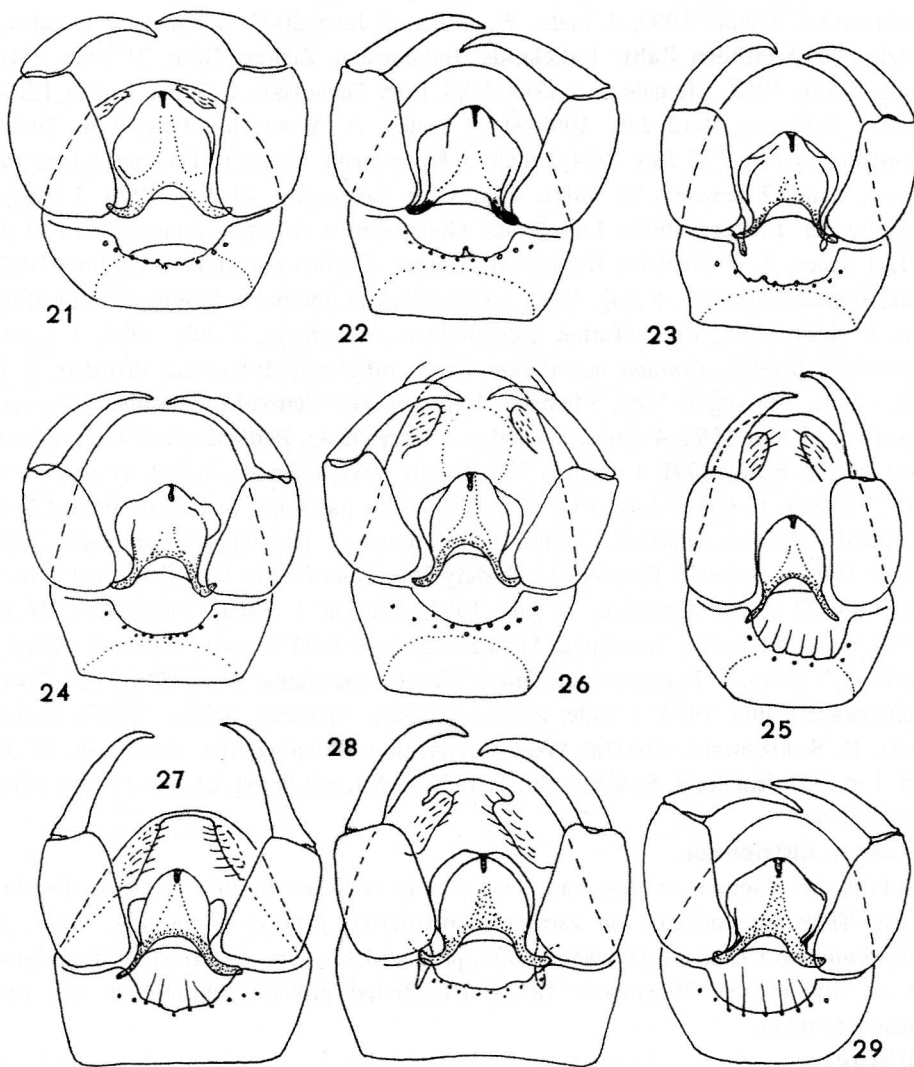
### Biology, distribution

Adults are common in May and June. Rarely collected in July and first decade of August. They are collected on various umbelliferous flowers (Apiaceae), *Ribes*, *Iris*, *Caprifolium* and *Crataegus* (DOWNES 1955, present data). Larvae terrestrial, found under bark of rotting tree (WINNERTZ 1852). Distributed probably throughout the whole Palaearctic region.

### Discussion

Types of *A. pavidus* were probably destroyed in Bonn during the II World War. The species exhibits strange and unusual within the genus variability in the shape and length of tergite IX in the male genitalia (Figs. 21-29). Usually within the same sample and locality

tergites are more or less similar, long or short. Only in the Białowieża Primeval Forest (Figs. 21-25) males have tergites highly variable in shape and size. *A. pollinivorus* with genitalia as in Fig. 23 is recognized here as a junior synonym of *A. pavidus*. It is rather unlikely that *A. pavidus* is a species complex.



**Figs. 21-29.** Male genitalia of *Atrichopogon pavidus*, ventral aspect. 21-25 - Białowieża, 26 - Rutka Tartak, 27 - Babia Góra Mts., 28 - Kunicha, 29 - Wyskok.



*Atrichopogon aethiops* (GOETGHEBUER, 1920)

*Kempia aethiops* GOETGHEBUER, 1920: 33 (male, female, Belgium).

*Atrichopogon (Kempia) aethiops*: EDWARDS 1926: 309 (Great Britain).

*Atrichopogon aethiops*: REMM 1988: 87 (Belgium, Great Britain, Estonia, Latvia);

KRZYWIŃSKI 1987: 795 (Poland, male genitalia).

*Atrichopogon pavidus*: HAVELKA & CASPERS 1981: 8 (Germany, misidentified).

**Diagnosis**

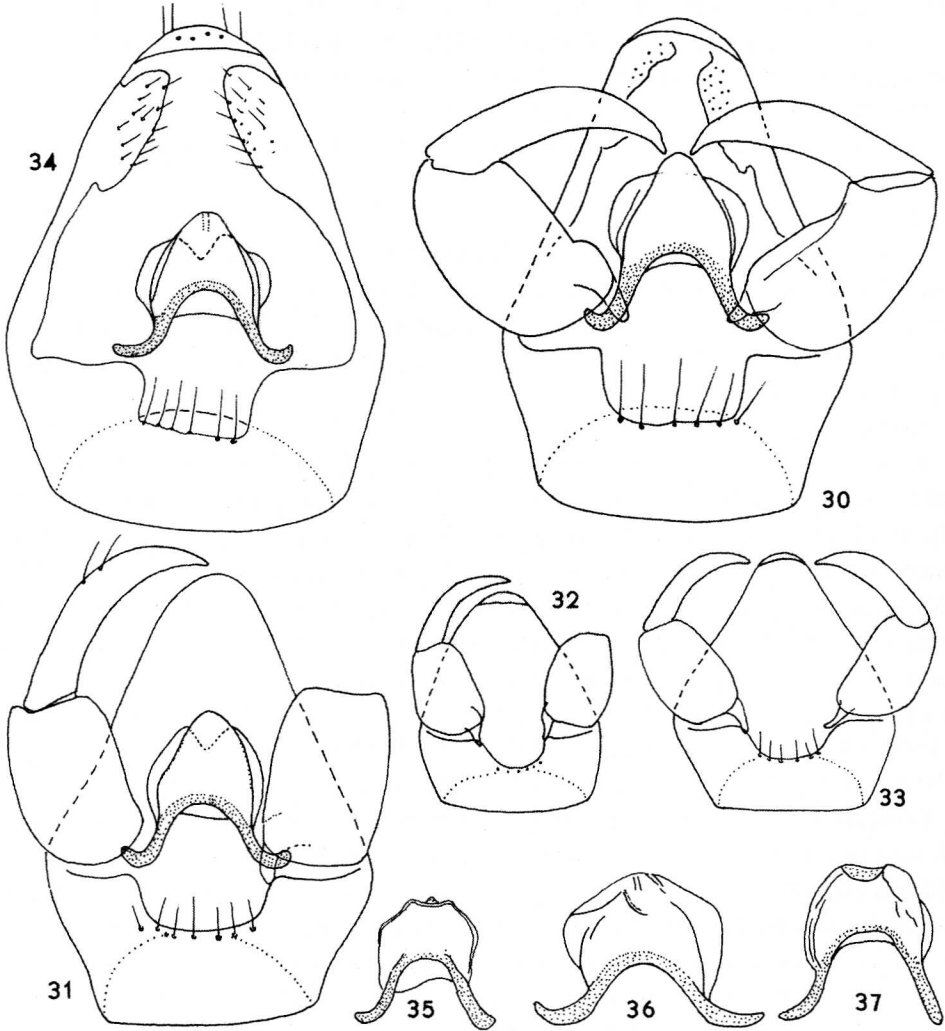
Smaller than *A. pavidus*, male wing 1.04 mm (0.95-1.13 mm) long (Table), female 1.04 mm, wing membrane always with macrotrichia at apex, and halteres dark brown, male flagellomere X 1.8-2.2 times shorter than flagellomere XI, female flagellomere IX 1.3 times shorter than flagellomere X; aedeagus weakly sclerotized along midline, tergite IX with triangular apex.

**Description**

**Male.** Eyes pubescent. Flagellum with flagellomeres II-VIII or II-VII fused, total length 584-656  $\mu\text{m}$ , AR 0.83-0.93, flagellomere X 1.8-2.2 times shorter than flagellomere XI (Fig. 17). Third palpal segment with small sensory pit on distal half, length 40-45  $\mu\text{m}$ , fourth palpal segment short, almost spherical. Wing length 1.04 mm (0.95-1.13 mm), CR 0.58-0.61, macrotrichia in cells R5 and M1 always present. Thoracic paratergite bearing 1-2 strong setae; usually 2 on left, right or both paratergites; only two specimens examined had 1 seta on both paratergites. Scutellum with 2 lateral and 2 submedian strong setae. Halter dark brown with more pale (yellowish when dry) apex of the knob. In mounted specimens in lateral view halteres dark brown or blackish brown. Claws with bifid apices. Tarsal ratio (TR) of fore leg TR(I) 2.3-2.5, of mid leg (TR(II)) 2.3-2.4, of hind leg TR(III) 2.1-2.2.

Genitalia as in Figs. 30-34. Sternite IX with deep caudomedian excavation, which bears 3-8 marginal setae in a row. Tergite IX elongate, longer than gonocoxite 1.7-1.9 times, evidently triangular, gradually tapering to an evenly pointed apex, extending beyond the gonocoxite, lateral and caudal margins curved ventrally. Cerci fused with lateral margins of the tergite. Gonocoxite short (88-100  $\mu\text{m}$ ), 1.1-1.4 times shorter than gonostylus, dorsal root of gonocoxite strong. Gonostylus evenly curved, without diagnostic features. Aedeagus with heavily sclerotized basal arch, ventral surface of the central body weakly sclerotized (Figs. 35-36).

**Female.** Similar to male with the usual sexual differences. Flagellum (Fig. 2) with distal flagellomeres VIII-XIII growing in length, flagellomere IX only 1.3 times longer than VIII; total length 484  $\mu\text{m}$ , AR 1.24. Palp as in Fig. 4, third palpal segment 44  $\mu\text{m}$  long. Wing length 1.04 mm, CR 0.67, macrotrichia present in cells R5 (36) and M1 (10). Paratergite bearing 2 setae. Halter blackish brown. Scutellum with 2 lateral and 2 submedian strong setae. Empodial hairs simple. Sternite VII and genitalia as in *A. pavidus*. Seminal capsule ovoid (Fig. 13), length 96  $\mu\text{m}$ .



**Figs. 30-37.** Male genitalia of *Atrichopogon aethiops*, ventral aspect, various magnifications. 30 - paralectotype, Gand, 31 - Kadyny 32, 33 - Dolina Będkowska, 34 - lectotype, without gonopods, Gand, 35-37 - aedeagus.

#### Material examined

**Types:** Lectotype male (present designation), red label "Ex Typis, Gand, 21-6-14, M. Goetghebuer, *Kempia aethiops* Goetgh., det. M. Goetghebuer, cf. Mem. Mus. Hist. Nat.

Belg. VIII (1920) 1920, fasc. 3 p. 35, coll. et det. M. Goetghebuer". Paralectotypes (present designations), 2 males labelled as follows: 1/ Gand (P), 21-6-1914, paratype (orange label), paratype M. Goetghebuer (green label), R.I.Sc.N.B. 18.073, coll. et det. M. Goetghebuer. 2/ Gand (P) 21-6-1914, 335, R.I.Sc.N.B. 18.073, coll. Et det. M. Goetghebuer (head missing). Originally pinned types now are mounted on microscope slides.

### Other specimens

**Poland:** Southern Baltic Coasts: Kadyny n. Tolkmicko, 10 July 1993, 1 male, J. Krzywiński. Silesian and Cracovian Upland: Ojców n. Kraków, 24 June 1988, 4 males, 1 female, R. Szadziewski; Będkowiec, Dolina Będkowska, n. Kraków, *Aegopodium podagraria*, 25 June 1985, J. Krzywiński.

### Biology, distribution

Adults collected in June and July. Reported from Belgium, Great Britain, Germany, Poland, Latvia and Estonia.

### Discussion

Exact determination of the species is possible using unique shape of the male genitalia. Other supporting characters should be used with a caution. *A. aethiops* is smaller and its halteres are darker than in *A. pavidus*. The male AR is higher, and flagellomere XI is evidently longer than flagellomere X (Table). Females of *A. aethiops* cannot be separated from *A. pavidus* by the shape of abdominal sternite VII as proposed by previous authors. Also proportions of flagellomeres proposed in keys were only formal characters (GOETGHEBUER 1934, REMM 1961).

**Table.** Numerical characters of males of the *pavidus* group.

	<i>A. pavidus</i>	<i>A. aethiops</i>
wing length (mm)	1.24 (1.17-1.33)	1.04 (0.95-1.13)
CR	0.59-0.64	0.58-0.61
flagellum length (µm)	680-810	584-656
AR (10-13/1-9)	0.69-0.77	0.83-0.93
flagellomere XI/X	1.4-1.6	1.8-2.0
3 <sup>rd</sup> palpal segment (µm)	48-60	40-45
setae on thoracic paratergite	1-3	1-2
tergite IX/gonocoxite	0.9-2.0	1.7-1.9
TR (I)	2.3-2.6	2.3-2.5
TR(II)	2.3-2.5	2.3-2.4
TR(III)	2.1-2.3	2.1-2.2

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Received: 10 November 2001